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| Topic            | Software                           |
| Project Partners | ICOM, Rapperswil, SG               |

## Preparation of 3D-data for HSR-Game with Motion

### Creating 3D-models of several buildings in an area based on open source programs and photogrammetry

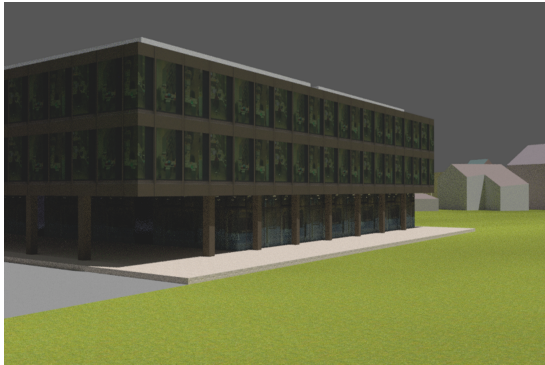


Fig. 1: Research Center of HSR campus generated with OSM2World software and textured with Blender software.

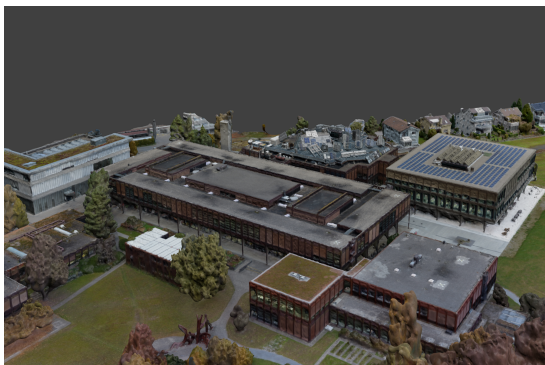


Fig. 2: 3D model of the buildings of HSR campus created using a drone and Pix4D software.

**Introduction:** In this project different approaches of creating a 3D model of an area with several buildings have been evaluated and openly documented. Aim was to create a realistic environment for a game. The workflow of the different approaches should be transferable, meaning that other users can easily adapt the workflow and use it for their area.

**Approach/Technologies:** As an initial situation there is a neighbouring institute, ICOM, which owns two 6DOF Motion-Simulators. Some games have already been integrated there. It is also ready to use the Unreal-Engine which combines motion-data (from any object) with the simulators. Next to that there exists OpenStreetMap (OSM) data which can be also used for 3D scenes. For example the research centre of HSR campus is mapped in a very detailed way (fig. 1 and 2). What is missing there - and in OSM in general - is the texture. As an alternative approach to that, there are very powerful photogrammetry tools like Agisoft Photoscan. Therefore, the focus of this thesis was to evaluate these two approaches: The first approach was using purely open data and open source software, such as OSM and OSM2World. The other approach used commercial photogrammetry software with and without the help of a drone. The progress of the implementation of the first approach (OSM) was faster than expected. Given that additional time it was decided to split the photogrammetry approach into two parts: 1. a manual approach with camera and 2. an approach using a drone with another commercial software (Pix4D Mission Planer). These (sub-)approaches have no dependencies.

**Result:** The three approaches have been completed, evaluated (fig. 3) and documented. All approaches created a 3D model of the HSR research centre. A workflow for all approaches was established and documented. As expected, the photogrammetry approach created a more realistic and detailed model than the one generated from OSM data. On the other hand, the photogrammetry approach is more expensive with all its software, tools and hardware involved. Either way, it takes a considerable amount of time to create a realistic 3D model of buildings. In the end, all approaches produced a 3D model which is fit for use for the purposes of a game. Depending on the available time, tools and requirements, one or the other approach is more suitable. The results of this project are the basis for a follow-up project called "HSR-Game with Motion". The 3D models are available now as a starting point, ready to be integrated into a game-engine.

|   | OSM2WORLD APPROACH  | PHOTOGRAMMETRY APPROACH  |
|---|---|--|
| <b>ADDITIONAL EQUIPMENT NEEDED</b>              | -   | reflex camera or drone   |
| <b>LICENSING COST</b>                           | free  | 185 CHF - 3590 CHF (Agisoft)<br>3200 CHF - 7900 CHF (Pix4D)  |
| <b>APPROX. EXPENDITURE OF TIME (WORST CASE)</b> | 70 hours  | 60 hours (reflex camera)<br>40 hours (drone)   |
| <b>APPROX. EXPENDITURE OF TIME (BEST CASE)</b>  | 40 hours  | 25 hours   |
| <b>SUITABILITY OF THE RESULT, STRONG POINTS</b> | <ul style="list-style-type: none"> <li>without texturing very quick generated</li> <li>sharp edges</li> <li>each object is represented as a separate object, editable</li> <li>suited for ground level near object model</li> </ul> | <ul style="list-style-type: none"> <li>faster to create</li> <li>able to depict any object</li> <li>very realistic</li> <li>great for arial overview models</li> </ul> |
| <b>EXPANDABILITY OF AREA</b>                    | whole workflow needed to be done again, but time consuming work points such as texturing are reduced  | Easy to add a new area part, may need to add additional tie points (time consuming)  |

Fig. 3: Comparison of the approach based on OSM2World and the approach based on photogrammetry software.